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ABSTRACT

Ideas concerning reflection in general, the role of reflection in cognitive apprenticeship, and reflection in action are discussed. The notion of reflection in a particular setting is presented for two cases: the professional education and training of physicians, and a teaching improvement program in which a teacher-teacher coach facilitates the improvement of teaching skills of attending physicians who staff the residents in a general internal medicine clinic (GIMC). Added meaning, relevance, and usefulness are given to the term reflection through the language of learning as conceptual change. Reflection is reviewed theoretically in cognitive apprenticeship and in reflective practice and as a conceptual change model of learning. The nature of knowledge to be learned through the reflective process focuses on professional management skills and knowledge about teaching methods appropriate to the GIMC. The Teaching Improvement Program in the GIMC (intended to offer a springboard for reflecting about teaching residents in the clinic) is described. Two episodes that occurred during a 1989 Teaching Improvement Project are analyzed for reflectiveness and interpreted in terms of the conceptual change model. Professional training is potentially an excellent setting in which supervisors can make use of the teaching strategy of reflection to foster conceptual learning. Reflection is one strategy that is the basis for self-learning. Contains 2 tables and 19 references. (SM)

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THE ROLE OF REFLECTION IN PROFESSIONAL MEDICAL EDUCATION: A CONCEPTUAL CHANGE INTERPRETATION

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Introduction

While the idea of reflection is well known in the writings of Tolstoy, Dewey, Schutz, Vygotsky, Lewin, Piaget, Wittgenstein, Hawkins, Herbart, Bartlett and Ausubel (Schon, 1988; Shulman, 1988), we are still in the position of needing to specify more clearly its meaning and function in the learning process (LaBoskey, 1988). In this paper we look at ideas concerning reflection in general, the role of reflection in cognitive apprenticeship, and reflection- in- action. These ideas are interpreted in terms of a model of learning as conceptual change (Posner et al, 1982; Hewson, 1981) which provides a possible way of understanding how reflection is achieved and why it is effective. The aim of this paper is to specify more fully the notion of reflection in a particular setting: the professional education and training of physicians (residents), and a teaching improvement program in which a coach (teacher-teacher) facilitates the improvement of teaching skills of attending physicians who "staff" these residents in a general internal medicine clinic (GIMC). The colloquial term "staffing" is poorly specified and complex, but can be loosely described as involving education, training and supervision in the practice of clinical medicine.

Theoretical Background

In a recent invited address to the Research In Medical Education Conference, Shulman (1985) suggested that one view of teacher education is "the development of reflective competencies and

socialization into a set of attitudes and dispositions about teaching as a deliberative, reflective act" (p 358). This approach provides opportunities for teachers to consider the reasons for their success or lack of it: it encourages individuals to become "students of teaching" (Cruickshank et al, 1988). From this perspective, an essential element of teacher education is the interaction between the learner i.e, the the student teacher, and the supervisor which fosters reflection in the learner concerning his or her knowledge, attitudes and skills in a particular field.

Reflection in cognitive apprenticeship

One view of reflection is provided in the framework of "cognitive apprenticeship" proposed by Collins, et al (1986). This renewed attention to a mode that has always been a traditional part of medicine provides useful concepts and vocabulary with which to describe clinical medical training.

The framework of cognitive apprenticeship applies to the development of a practical knowledge base and both thinking skills (knowing how to solve problems) and motor skills (being able to carry out medical procedures). In cognitive apprenticeship in the medical field, expert medical practitioners (attending physicians) enable learners (residents) to improve their medical knowledge, attitudes, and skills by participating in the task of patient care. The learner carries out aspects of the task while observing and learning from the expert through methods of <u>modelling</u> and <u>coaching</u>. The expert supports the

learner in these tasks through scaffolding (carefully designed help in the form of prompts, suggestions, or limited assistance) which is removed progressively, called fading, as the learner develops his or her own expertise. Through processes of articulation and reflection, learners are able to compare their knowledge, attitudes and skills with those of experts, colleagues and their own conceptual models, and learn in the process .

Reflection involves "replaying" the performances of both attending physician and resident for the purpose of articulating what is or was happening. Articulation means making knowledge which is normally tacit more explicit, that is, available for scrutiny and analysis. For example, through articulation and reflection, the progress of the resident may become more apparent and controlled, and expert knowledge (which is normally automatic and not readily available to the learner (Norman, 1985)) may become more accessible.

Reflection in reflective practice

A discussion of reflection is provided by Schon (1983, 1987, 1988) in the context of reflection- in- action in the professional training (coaching) task. He sees the coaching task in terms of nested interactions involving the supervisor, the teacher, the learner and the phenomenon with which the learner is interacting, represented thus:

SUPERVISOR <-> [TEACHER <-> (LEARNER <-> PHENOMENON)]

We have translated this formula to be relevant to the faculty development process concerning clinical teaching in medicine thus:

COACH <-> [ATTENDING PHYSICIAN <-> (RESIDENT <-> PATIENT)]

and abbreviated the formula thus:

C<->[AP<->(R<->Pt)

...where the coach (C) is an educator involved in a faculty development program designed to improve the teaching skills of attending physicians (AP) who interact with residents (R) concerning the residents interaction with patients (Pt). It should be remembered, however that the term "coach" is generic, and the educator, the attending physician or the resident can serve as a coach in their interactions with each other.

According to this model there are three levels of interaction which provide opportunities for reflection. In the medical field we have described these levels as follows:

Level 1. [R<->Pt] The resident's interaction with the patient concerning issues such as how the resident responds to the patient and the medical problem, how the resident obtains the history, does the physical examination, selects lab tests, makes a diagnosis and develops a treatment plan (medical issues).

Level 2. [AP<->R] The attending physician's interaction with the resident concerning issues such as how he or she evaluates a resident's competency, instructs a resident on medical facts or

procedures, achieves optimal patient care, and ensures patient education is effective (medical and educational issues).

Level 3. C<->AP The coach's interaction with the attending physician concerning how the coach responds to the attending physician's observed teaching behavior concerning the staffing process (educational issues).

Reflection- in- action can be difficult to detect. One way of doing so is by means of teachers' self reports (Russell and Johnson, 1988), or by reflective journal writing (Richards and Gipe, 1988). Collins et al (1986) suggest "post mortem" discussions soon after the teaching episode, video or audio recordings which reproduce the performance of the learner and expert, and summarized replays of actual performances which highlight selected aspects of teaching and learning. In the faculty development program in the GIMC, however, we look for reflection- in- action by videotaping attending physicians' interactions with their residents, and subsequently reviewing the tapes with them. The reviews are done in conjunction with data from an instrument developed to assess effective teaching in the clinic. These replays of teaching interactions provide attending physicians with the opportunity for reflective conversations in which they are able to criticize, reframe and test understandings of teaching experiences.

A central issue of Schon's term reflection- in- action appears to be this notion of "framing" which may also be understood in terms of

structuring an understanding of a problematic situation, and "reframing", or restructuring the conception:

> "When he (the practitioner) finds himself stuck in a problematic situation which he cannot readily convert to a manageable problem, he may construct a new way of setting the problem -- a new frame which, in what I shall call a 'frame experiment', he tries to impose on the situation.
>
> When he is confronted with demands that seem incompatible or inconsistent, he may respond by reflecting on the appreciations which he and others have brought to the situation. Conscious of a dilemma, he may attribute it to the way in which he has set the problem, or even to the way in which he has framed his role. He may then find a way of integrating, or choosing among, the values at stake in the situation." (Schon, 1983, pp 62-63)

Reframing is thus a response to reflection- in- action.

A reframed problem allows different problem solving strategies to emerge with an increased understanding of options or strategies. Reframing may occur when a practitioner has a reflective conversation with a situation:

> "the practitioners' moves produce unintended changes which give the situation new meanings. The situation talks back, the practitioner listens, and as he appreciates what he hears he reframes the situation once again" (Schon, 1983, 131-2).

Reframing may also occur in the reflective dialogue between the supervisor and the practitioner about the situation, i.e., the supervisor helps to reframe problematic situations for the practitioner. Moreover this reframing may occur at all three levels of the nested interactions.

In the medical setting the resident may reflect on the medical problems of the patient and reframe the problem; the attending physician may help the resident reframe a case so that the differential diagnosis is changed; and the coach may help the attending physician reframe the problem concerning his or her staffing of the case. With the reframing process, new

understanding of a situation or problem may develop. New knowledge may thus be created through the reflective process: learning has taken place.

The conceptual change model of learning

An alternate understanding of the notion of reframing may be found in the model of learning as conceptual change (Posner et al, 1982; Hewson, 1981). This model is based on a constructivist perspective (Magoon, 1977) which assumes that humans construct their own knowledge, using their existing knowledge to do so. In the process of construction, they develop relatively stable patterns of belief. They construct knowledge in ways that are to them coherent and useful. The construction process, however, is influenced by a variety of common social experiences. Thus the knowledge constructed by each individual need not be completely personal and idiosyncratic. From a constructivist point of view it can be argued that clinical teachers build conceptual structures in which they incorporate their teaching experiences, instructional concepts, supervisory concepts, and concepts of medical practise.

This perspective suggests that meaningful learning (as opposed to passive, rote learning) involves changing conceptual structures (conceptions). From this point of view learning involves an interaction between new and existing conceptions with the outcome being dependent on the nature of the interaction. Learners use their existing knowledge to determine whether a new conception is <u>intelligible</u> (knowing what it means), <u>plausible</u> (believing it to be true), and <u>fruitful</u> (finding it to be useful or beneficial). A change in conceptual structure is preceded by a necessary

experience of dissatisfaction with the existing knowledge in the face of the new knowledge. If a new conception satisfies all three conditions, learning proceeds without difficulty and the new conception is integrated into the existing conceptions. If, however, it conflicts with existing conceptions, then learning requires that existing conceptions be further differentiated or even exchanged for the new. The recognition that change of this nature may have to occur forms the basis of the conceptual change model of learning.

An explicit implication of the conceptual change model of learning for teachers is that they need to know what their students' existing conceptions are, and why they hold them. This is necessary if they are to assist the learners find the new conceptions intelligible, plausible, and fruitful, and, if necessary, take measures to allow the learner to experience dissatisfaction with existing conceptions. Such measures include teaching strategies involving the introduction of discrepant events (Nussbaum and Novick, 1982), debates on conflicting points of view (Hewson and Hewson, 1983, 1984) or socratic tutoring in which the learner is led, by questioning, to face the logical inconsistencies of an argument (Nelson, 1949). We are suggesting that the fostering of reflectiveness in both teachers and learners provides a potentially rich intellectual environment in which the learner is helped to become aware of his or her own existing conceptions, compares them with other, competing conceptions, evaluates them and consequently is either satisfied with the existing knowledge, or dissatisfied, in which case the learner is poised, ready to learn.

The Nature of Knowledge to be Learned Through the Reflective Process

Professional management skills

The residency training years aim to provide newly qualified physicians with the practical skills characteristic of experts in the particular medical field. This practical knowledge relies heavily on the knowledge and skills developed in the medical training, but also requires a more intangible appreciation of how to solve medical problems and provide medical care in contexts which are sometimes constrained by information which is insufficient, unclear and uncertain.

These professional management skills involve a high level integration of medical knowledge and clinical reasoning skills, interpersonal skills, technical skills, and attitudes to patients and their medical care. They include the ability to assess properly the degree of medical severity of a patient problem, to integrate both the physical and psychosocial aspects of this problem, and to initiate an ordered evaluation of the complaint (in which the physician initially commits him or herself only to those diagnostic tests which will demonstrate whether or not further, more extensive diagnostic tests will be necessary). Furthermore, the physician's relationship with the patient involves skills in interviewing, negotiating the problem, developing a collaborative contract, and educating the patient in such a way as to ensure trust and compliance, in order to maximize the caring and curing process.

Knowledge about teaching methods appropriate to the GIMC

A naturalistic research study in which attending physicians were interviewed concerning their functions in staffing residents led to a specification of this conception in terms of six roles (Hewson and Jensen, in prep). The roles which thus far have no empirical analytic basis are:

Clinical role model in which the attending physician displays attitudes, clinical knowledge and skills to the resident

Professional mentor in which the attending physician serves as a trusted counselor to the resident

Clinical supervisor in which the attending physician optimizes patient care in the clinic

Instructor in which the attending physician uses instructional methods appropriate to the GIM clinic

Evaluator in which the attending physician seeks feedback from, and gives appropriate feedback to the resident

Consultant in which the experience and knowledge of the attending physician are used in patient care

The teaching role of the attending physician is thus diverse and includes the narrower concepts of instruction and evaluation. Clinic teachers need to understand the range of roles required of them as well as the usefulness of a variety of teaching strategies, including that of reflection (which is a teaching behavior listed in the role of Instructor).

The coach in a teaching improvement program, i.e., the educator, is required to facilitate "learning about teaching" in the attending physicians. This primarily involves a reflective conversation about teaching appropriate to the GIMC in which the coach provides appropriate information to the attending physician, stimulating a conversation about teaching methods (articulation), and encouraging the attending physician to scrutinize his or her own teaching performance and rationale for teaching.

The Context of this Knowledge

Changing hospital practices mean that more people receive their medical care as out-patients, and it has consequently become increasingly important for clinics to provide residency and clerkship training for those planning to practice medicine. The physician in the GIMC takes into account a number of factors which include: being able to make primary diagnoses which result in out-patient treatment, admission or referral to other subspecialties; ensuring continuity of care for patients; containing costs; practising medicine in inter- or multidisciplinary teams; ensuring that patient education is effective; practising medicine in the context of cultural and economic factors; and practising the psychosocial aspects of medicine.

A typical "staffing" session in the clinic setting involves the following steps: The resident meets the patient in the conference room and obtains a history of the illness, does a physical exam, establishes the differential diagnosis and a final diagnosis. The resident will then consult with the attending physician in the team conference room, review the findings concerning the patient, and discuss the treatment plan. The attending physician may then decide to see the patient him or herself in which case both the attending physician and resident will proceed to the patient's room and the attending physician will question or examine the patient. Either the resident or attending physician will finish with the patient and the resident will complete the charts which the attending physician may check later.

Teaching Improvement Program

The program is intended to provide a springboard for reflecting about teaching residents in the clinic. In the video review process, the interactions under consideration concern level 1: interaction between the (R<->Pt), and level 2: interaction between [AP<->R]. In the subsequent feedback session with the attending physician, the coach generates information concerning level 3: interaction between C<->AP.

In the Teaching Improvement Program in the GIMC, attending physicians assess their own teaching performance and are also assessed by their regular residents by means of a questionnaire, the Wisconsin Inventory of Clinic Teaching (WICT). The WICT was developed in a naturalistic study which solicited the views of both attending physicians and residents concerning effective teaching behaviors in this setting (Hewson and Jensen, in prep). In addition, the attending physicians are videotaped when staffing residents in the clinic. The medical education team then analyzes the questionnaire data and presents a written report to each attending physician. Based upon this report, the medical education team and the attending physician negotiate selected behaviors on which to focus while watching the interactions between attending physicians and their residents on the videotapes. In a subsequent meeting, the attending physician is invited to report on any learning that may have occurred.

In the language of conceptual change, the video review process makes it possible for the attending physicians to assess their observed teaching behaviors against the ideals of the WICT. In this way they may register dissatisfaction (according to one attending physician: "a provocative dissonance") with these behaviors and the concepts, attitudes and skills

that underlie them. This dissatisfaction is the precursor for meaningful learning about teaching by the attending physician.

Data for Analysis

Two episodes that occurred during the Teaching Improvement Project in 1989 are analyzed for reflectiveness and then interpreted in terms of the conceptual change model.

Episode 1

In the faculty development program the C and AP were in the negotiation phase in which they were discussing the issues for focus while watching the videotapes of the AP's staffing interactions with his R. The AP had mentioned that he did not understand the relevance of the WICT item: "promotes reflection in the resident regarding medical practice". The C suggested that the videotape should be analysed for an instance where reflection would be useful in promoting resident learning.

The tape revealed a verbal interchange between the AP and a R which took place in a hallway in the few seconds between completing a case presentation in the conference room and examining the patient together in the examination room. The R told a story of a different case he had managed in the emergency room (ER) a few days earlier. In this dialogue, the R described his concern about a patient with chest pain which he had diagnoses as esophageal pain. He was criticized by ER staff who favored obtaining an electrocardiogram, presumably, to exclude the diagnosis of heart attack. The AP's first response was to enquire which of the diagnoses

was correct, and then proceeded to recount a similar experience of his own in which a patient presented in the ER with two possible diagnoses. The dialogue of this interaction is presented in Table 1.

Table 1 here

The C then pointed out that reflection on the resident's story could have led to a better understanding of the resident's concerns.
This, in turn, could have developed into a valuable discussion with instructional implications. The AP left the review session saying that, in general, he found it most worthwhile (but it was not disclosed which specific aspects of the session were most appreciated).

Analysis and discussion of Episode 1

In the session between AP and R we can surmise that the AP's understanding of the incident introduced by the R can be summarized in the following statements:

- alternative diagnoses of the patient's condition existed;
- the patient responded to treatment based on one diagnosis;
- thus the AP and R were satisfied that a correct diagnosis of the condition had been made.

In recounting a story of his own, we can assume that the AP implicitly indicated that he felt the previous incident had been satisfactorily concluded. Further, we can surmise that two significant aspects of this story for the AP had been the problem of alternative diagnoses on the basis of available evidence (a cognitive problem), and the discomfort of feeling

criticized by or in disagreement with colleagues (an affective problem), since the incident which he subsequently introduced hinged on precisely these issues. A reasonable interpretation of the episode, therefore, is that the AP had adopted the role of clinical supervisor in which the care of the patient was his main concern, and of a mentor in which he commiserated with the R by telling a similar story involving professional disagreement.

Since the R had apparently convinced the AP that he had made the correct diagnosis we surmise that the AP found no further reason to focus on the R or his concerns. The AP did not use this opportunity to engage the R in a reflective conversation about either medical management in emergencies, the problems of managing professional disagreements or the appropriateness or reliability of specific tests for medical diagnoses.

The episode might have evolved in an entirely different way had the AP chosen to reflect on the R's understanding of the incident. An alternative understanding can be summarized as follows:

- alternative diagnoses of the patient's condition existed;
- there is a conflict of opinion between R and ER staff regarding patient management;
- the R may need help in understanding the issues inherent in the episode, viz., medical diagnosis (the problem of diagnosing in terms of signs and symptoms presented by the patient) and patient management skills (the diagnostic procedure in the emergency room).

In such circumstances, the AP might well have adopted a different strategy; reflecting on the R's understanding of the issues directly with the R, and by helping the R to reflect on his own story of a similar episode.

Of relevance here is Schon's (1988) identification of the sharing of stories as an important part of a professional's activities. He suggests that stories are, indeed, products of reflection and can be seen as metaphors or projective models which may be transformed and validated in subsequent situations. The inference is that individuals react to stories by "looking" at them and attending to the meanings built into them. This, however, remains a tacit process, and the meanings intended and received from the telling of stories are not available for scrutiny. We suggest that story telling and trading may be enhanced when meanings are made explicit in an abstracted replay of the story in which the intent and features of the story are highlighted (see also Collins et al, 1986, p. 24). This did not happen in the episode reported here which suggests that story trading has a limited impact compared with its potential as an instructional strategy.

In terms of the conceptual change model, we can assume that the suggestion of being reflective about a story (such as that related by the R) may involve making the word "reflection" used in the context of staffing in the GIMC, plausible, and demonstrating its fruitfulness to the AP. In order for this to happen, the AP has at least to compare the different outcomes of being reflective and not being reflective. This can be a mental activity: a thought experiment triggered by some event. In this case the trigger was the WICT questionnaire item and the suggestion of the C.

What is at issue here is to analyze what happens in reflection of this sort. Primarily, reflection is a metacognitive activity: it is not being a physician and making diagnostic decisions; it is thinking about being a physician and the process of resolving the conflict between different diagnoses or between people making these diagnoses. Thus the process of finding something plausible and fruitful is the metacognitive activity that occurs through reflection.

Episode 2

An AP who is deeply interested in his instructional role in the staffing of residents was dismayed to find that one of his residents found fault with certain of his teaching behaviors. During the videoreview of his interactions with residents he became aware of behaviors which he interpreted as having a negative effect on a particular resident. This realization made him profoundly dissatisfied with his knowledge and skills in instructing. In this state of "provocative dissonance" he resolved to try a different approach with this resident. After some months, the AP recorded the events in the form of a self report, presented in Table 2.

Table 2 here

In a follow up videotape (one year later) the C observed that the behavior of the AP had indeed changed: he was no longer using the "eductive" approach by asking leading questions. He was considerably more invested in "collegial" questioning in which he and the R apparently worked on the case together, with the R taking the lead. The R no longer displayed the signs of passivity and automatic concession to the AP's opinions and advice.

Analysis and discussion of Episode 2

After the session between AP and R (a level 2 interaction), the AP's understanding of the episode, by his own account, can be summarized as follows:

- as an AP I need to find out the R's understandings;
- I do this with eductive questions;
- my questions and suggestions are agreeable to the R, and, as a consequence, he changes his mind.

From the outline it was clear that the AP's primary focus was the R rather than the patient. He was concerned about how the R came to make his diagnosis and obtained this information through probing the R's understanding. His input was directed at effecting changes in the R's thinking. The concern for the patient was implicit: by influencing the R's thinking, he would come to a different, more correct diagnosis, and would thus be able to attend to the wellbeing of the patient. In other words the AP saw his primary role as instructor; it was mainly through this role that he played the role of clinical supervisor.

The responses which the R made in completing the WICT carried the clear implication to the AP that his understanding as summarized above was less than satisfactory, i.e., the AP became dissatisfied with his interpretation of the episode. Reviewing videotapes of the episode led him to reconsider, as a result of which he reached an interpretation which can be summarized thus:

- as an AP I need to find out the R's understandings;

- I do this with eductive questions;
- my questions and suggestions are not agreeable to the R;
- the R remains unconvinced, yet feels constrained to follow my advice.

This revised interpretation was obviously unsatisfactory to the AP, and served to drive the changes which he wanted to effect, viz., a change within the role of instructor. He still had the same goal of understanding the R's understandings; what changed was his view of how the same goal was to be achieved. His implicit conviction was that he should operate in a different way within the same role by asking different kinds of questions in a different way, i.e., he would move away from asking factual questions toward seeking opinions and reasons for these opinions: a more Socratic approach. It is relevant to this argument that the Socratic method is based on "regressive abstractions" in which the individual eventually recognizes his own understanding or even ignorance (Nelson, 1949). This teaching method, based on logic, utilizes reflection to transform undifferentiated personal understandings into clearer understandings. It is similar to that of reflection from the perspective of the model of learning as conceptual change.

In terms of the conceptual change model, the AP's initial interpretation of the R's reactions was one that he found intelligible and plausible. He may even have found it fruitful in that the R acted in seeming accordance with the interpretation. Yet when the AP was presented with evidence that the R viewed the episode in an entirely different light, he found the R's listed criticisms and his hypothesized reasons for R being critical sufficiently

plausible that it created dissatisfaction with his existing interpretation and thus to its exchange. Reflection on the episode allowed the AP to step back from his initial interpretation. In doing so it was important that he had at least one alternative to consider; without a viable alternative, there is nothing with which to exchange the initial idea. As before, reflection allowed the occurrence of the metacognitive activity that is a necessary part of finding something plausible and fruitful.

Summary and Conclusions

It has been our intention in this paper to give added meaning, relevance, and usefulness to the term "reflection" through the language of learning as conceptual change. We wanted to understand what reflection is, and why it is effective in facilitating learning.

Reflection has been described in terms of the ideas of Shulman (1985,1988), Collins et al, (1986) and Schon (1983, 1987, 1988) and from these writings it is possible to say that, among other things, reflection provides us with a way of thinking about teaching. The conceptual change model, on the other hand, provides a way of thinking about learning. By considering reflection in terms of the model, we are dealing with the relationship between teaching and learning.

By selecting specific episodes in a teaching improvement program in an academic, general internal medicine clinic, we were able to highlight incidents of reflectiveness. These reflective incidents were shown to occur in a milieu in which conceptual learning could occur. This was especially

true in Episode 2 where the attending physician used a self report to describe his own learning. In other words, reflection was a self-teaching strategy that appeared to create the conditions in which learning could take place. One reason for this is that reflectiveness may encourage an individual to consider his or her own understandings in relation to others that are known or being presented. This is just the type of activity that is necessary in order to assess the plausibility and fruitfulness of conceptions, thereby leading to conceptual learning. It is important to note that this requires metacognitive activity on the part of the learner.

The teaching improvement program provides opportunities for reflection. The role of the coach is to use the data from the questionnaire and the recorded teaching performance as a means of stimulating the reflective process. On these occasions the practitioner steps outside of practice and makes practice the object of attention (reflection). When the practitioner has a reflective conversation with a medical situation, this benefits medical practice by providing a deeper understanding of issues in a given context, such as the professional management skills described earlier. When an attending physician has a reflective conversation with a resident, this benefits the resident by making attending physicians' knowledge explicit which would otherwise remain implicit and inaccessible. It also benefits the supervisor by making the resident's knowledge more visible and open to scrutiny. Interpreting the teaching improvement program from the point of view of the conceptual change model helps us to understand better that this type of activity fosters learning by encouraging reflection: a metacognitive activity in which individuals are able to restructure their

personal understandings as a consequence of assessing their intelligibility, plausibility and fruitfulness.

Professional training is potentially an excellent setting in which supervisors (or coaches) can make use of the teaching strategy of reflection to foster conceptual learning. While reflection is not the only possible teaching strategy, it is one that is the basis for self learning, a lifelong skill that is required in professional practice generally, and in medical practice in particular. In addition, the small group interactions, especially the one- on- one interactions between the attending physician and resident in the clinic provide environments optimal for reflection, and therefore for conceptual learning.

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TABLE 1 Dialogue between attending physician (AP) and resident (R) in hallway conversation during staffing

R: Some guy came in with epigastric ---
AP: Was that Mr X?
R: Yes. He came in for pain again today. He's 45. Clips go through my mind --- you know, epigastric pain --- Youthink of cardiac problems, just listening to it --- But you go in, and you know, just touching it hurt. I didn't think an ECG was that important, I just didn't. No risk factors --- just clinically, that hurt right there (points to upper abdomen)
AP: Mmmmm
R: The ER people were all over my back for not getting an ECG. On paper, I can understand, but clinically --- C'mon Guys!
AP: It was normal?
R: Yup!
AP: I thought you were going to tell me the guy was now in hospital with a heart attack! (laughs)
R: No, no! I gave him a little cimetidine --- and it resolved.
AP: So it's an esophageal spasm! That's what we thought before! ---- I had a good case last week ---
R; What was that?
AP: Man had a chronic headache for three days. He was taking a lot of medicines at home. His wife went out at 5.30, came back at 9.30, found him lying on the bathroom floor. He'd vomited. They brought him in and messed around with a tox screen, and finally got him on the schedule for a CT and found he had a subdural hemorrhage ---
R: Was it spontaneous or traumatic?
AP: How do you tell?
R: Well, in the history of head trauma ---
AP: No, well, he has home alone and could have hurt his head on the bathtub or toilet --- And there wasn't any trauma on the surface ---

(Conversation ends as AP and R enter examination room to see another patient)

Table 2 Self report by an attending physician concerning his learning in a teaching improvement program

At my last clinical teaching review session, I became aware of one resident who scored me 2/5 (low) on a few items in the WICT. The items were: "recognizes personal limitations and errors", "shows sensitivity to resident's feelings", "inspires confidence in the resident...", "clearly explains underlying rationale/basis for his opinions/advice", "demonstrates a flexible, open-minded approach to suggestions by residents", and "gives positive feedback for appropriate behaviors". I summarized these as follows: It seemed that the resident was feeling constrained and under-appreciated, hurt by my actions during supervised clinic sessions, and unable to express his own growing clinical independence, or unable to appreciate how my suggestions were better than his, and yet, he seemed to feel constrained to follow my advice.

Because there were only three residents, I was able to deduce a likely resident who may have felt this way. I reviewed selected segments of interaction with this resident during my video review session with the teacher-coach. I perceived that there was a strain in one interaction in which the resident began the presentation in his usual energetic fashion, but during the case discussion, became passive and ended up conceding to my advice. I thought about my work with this resident frequently for several weeks. Then I decided to review the entire tape which included several case discussions with this resident. I have developed some hypothetical understandings of why he would feel the way he does about my teaching. I believe that my general tendency to ask a lot of probing questions does not work well with this resident. He seems to react adversely, possibly being intimidated, or discouraged by the time it takes, possibly being unconvinced about my rationale yet feeling reluctant to argue with me. In addition he appears to create a practical short-term solution by becoming passive, finally, soliciting my advice and agreeing to it. I have been fooled, in a sense, by thinking that he found my advice agreeable with his own ideas and unconflicted about carrying it out.

I have decided to work more deliberately to fully elicit this resident's ideas before offering my own. Rather than asking specific eductive questions, I want to ask more general "what is your opinion/analysis..." questions. And then I will ask more truly Socratic questions to help him discover the problems in his own thinking. I believe that I have overlooked the strong independence of this resident in relation to his own education: this is ironic because I have a very strong independence need in my own learning and expect it to be respected.

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